

What is claimed is:

- 1 1. A method of planarizing a non-planar conductive surface layer on the workpiece,
2 comprising:
3 applying a conducting material layer onto a top surface of the conductive surface
4 layer of the workpiece using one of a spin-on, spray, doctor blading or other
5 application technique that does not involve electroplating so that a top surface of
6 the conducting material layer is planar, thus forming a planarized multi-layer
7 structure that includes the non-planar conductive surface layer and the conducting
8 material layer; and
9 electropolishing the planarized multi-layer structure to remove in a planar manner at
10 least portions of the non-planar top conductive layer and other portions of the
11 conducting material layer, wherein the electropolishing in the planar manner is
12 assisted by using conducting material in the conducting material layer that will
13 electropolish at substantially the same rate as the non-planar conductive surface
14 layer will electropolish.
- 1 2. The method according to claim 1, further comprising the step of annealing the
2 conducting material layer so that at least one solute within the conducting material layer
3 diffuse with the conductive surface layer.
- 1 3. The method according to claim 2, further comprising the step of continuing to anneal
2 the conducting material layer so that the diffusion of the solute progresses into features of the
3 conductive surface layer.
- 1 4. The method according to claim 1 further comprising the step of removing any
2 remaining portion of the planarized multi-layer, thereby exposing a barrier layer.
- 1 5. The method according to claim 4, wherein the step of removing uses a chemical
2 mechanical polishing process.

1 6. The method according to claim 4, wherein the step of removing uses one of a wet
2 etching process.

1 7. The method according to claim 1 further comprising the step of removing any
2 remaining portion of the planarized multi-layer and a barrier layer, thereby exposing the
3 dielectric layer.

1 8. The method according to claim 7, wherein the step of removing uses a chemical
2 mechanical polishing process.

1 9. The method according to claim 7, wherein the step of removing uses one of a wet
2 etching process and a reactive ion etching process.

1 10. The method according to claim 1 wherein the conducting material comprises at least
2 one of a conducting paste, a conducting slurry and a conducting emulsion.

1 11. The method according to claim 1 wherein the conducting material comprises a
2 conducting slurry.

1 12. The method according to claim 1 wherein the conducting material comprises a
2 conducting emulsion.

1 13. The method according to claim 1 wherein the conducting material comprises a
2 conducting low melting point metallic powder.

1 14. The method according to claim 1 wherein the conducting material comprises a first
2 layer of a conducting low melting point metallic powder and a second layer of a slurry.

1 15. The method according to claim 1 wherein the step of electropolishing uses an
2 electrochemical mechanical etching process.

1 16. The method according to claim 1 wherein the step of electropolishing uses an
2 electrochemical etching process.

1 17. A workpiece comprising:
2 a substrate;
3 an insulating layer formed over the substrate and having features defined within the
4 insulating layer;
5 a conductive layer disposed within the features, and at least a portion of the
6 conductive layer within the features having a diffused solute disposed therein;
7 and
8 wherein the workpiece is formed by:
9 applying a conducting material layer including the solute disposed therein onto a top
10 surface of the conductive layer of the workpiece;
11 annealing the conducting material layer so that the solute within the conducting
12 material layer diffuses into the conductive layer within the features; and
13 removing portions of the conductive layer not disposed within the features and the
14 conducting material layer.

1 18. The structure according to claim 17 wherein the removing is performed by
2 electropolishing in a planar manner.

1 19. The structure according to claim 18 wherein the electropolishing in the planar manner
2 is assisted by using conducting material in the conducting material layer that will
3 electropolish at substantially the same rate as the conductive layer will electropolish.